Improving Functional Independence with Rehabilitation Following a Metastatic Melanoma Brain Tumor Resection: A Case Report

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Background: Melanoma is a cancer that begins in the melanocytes. Melanomas can occur anywhere on the skin, but are more likely to start in the trunk for men and the legs for women.[1] In 2014, an estimated 76,100 new melanomas will be diagnosed (about 43,890 in men and 32,210 in women).[2] An estimated 9,710 people are expected to die of melanoma (about 6,470 men and 3,240 women).[2] Each year about 100,000 people in the United States are diagnosed with brain metastases.[4] Five to 25 percent of cancer patients will develop metastases in the brain.[4] One of the most common primary tumors to spread to the brain is malignant melanoma.[4] In nearly 50 percent of people with melanoma that has metastasized, the disease can be found in the brain.[4] Melanoma will commonly spread to nearby lymph nodes (50-75%), lungs (70-87%), liver (54-77%), and bone (23-49%).[5] Once melanoma has spread to distant sites, it is in stage IV. Patients who have a stage IV cancer have a 5-year survival rate of 15% to 20%, and a 10-year survival of 10% to 15%.[3] Treatment in stage IV may include surgical excision, chemotherapy, immunotherapy, and/or radiation therapy.[5] Neurosurgeons use brain-mapping techniques to avoid injury to sites of language, motor, and sensory function during surgery.[6] Patients who have surgery to remove a brain tumor will benefit from rehabilitation during the acute phase to help improve functional outcomes.

History: A 67 year-old male with a one year history of melanoma complained of headaches 1-2 weeks prior to admission to an acute care hospital with left sided hemiplegia and dysarthria. A head CT scan revealed an intracerebral hematoma and a lesion suspicious for metastasis within the right parietal lobe. A right parietal craniotomy, evacuation of the hematoma and resection of the brain tumor were performed and the pathology revealed metastatic melanoma.

Examination: The patient propelled the wheelchair 50 feet with minimal assist for direction. Max assist was required for all bed mobility, with help to trunk and left lower extremity. Max assist for a squat pivot transfer from the bed to and from the wheelchair. Verbal and tactile cues were needed to help perform a squat pivot transfer. The Function Independence Measure (FIM) is an 18-item test on seven point scale that was used to measure progression of functional independence

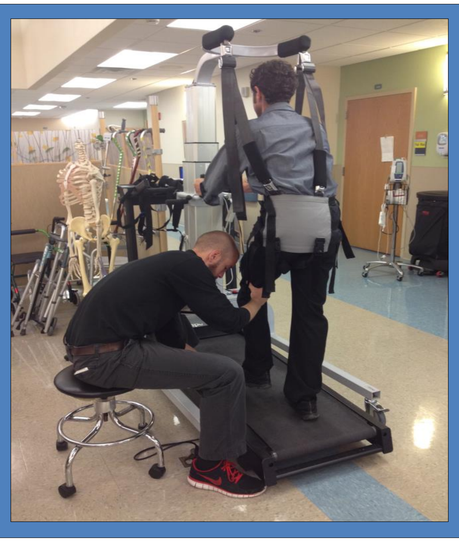
Test and Measure	Initial Results - Right	Initial Results - Left
Sensory Integrity: Light touch	Normal sensation to both right and left lower extremity with light touch	
Sensory Integrity: Sharp/Dull discrimination	Normal right lower extremity.	Impaired distal/lateral calf and foot for left lower extremity.
Sensory Integrity: Proprioception	Normal for right lower extremity.	Unable to correctly identify left great toe position on 4 out of 5 trials. Impaired left lower extremity proprioception.
Function is Sitting test (FST)	Scored a 45/56	
Berg Balance Test	Unable to be completed at this time.	
Reflex Integrity	Normal patellar and Achilles reflex to right lower extremity.	Absent patellar and Achilles reflex to left lower extremity.
Motor function: Muscle tone/Modified Ashworth scale.	Normal muscle tone to right lower extremity.	Flaccid left upper extremity and essentially flaccid right lower extremity. Negative for clonus at left ankle., Zero on modified Ashworth
mCTSIB (modified clinical test of sensory interaction on balance)	To be given when able to stand independently, will choose which test most appropriate.	
Functional Independence Measure (FIM)	Scored a 56/126 initial evaluation from PT, OT, SLP. **Physical Therapy measured categories:** Bed to chair transfer: 2 – Max Assist, Toilet transfer: 2 – Max Assist, Shower transfer: 1 – Dependent, Wheelchair propulsion: 1 – Dependent, Ambulation: 0 – Activity does not occur, Stairs: 0 – Activity does not occur	

Goal activity	Assist level for Goal (STG)	Assist level for Goal (LTG)	Device for Goal (STG)	Device for Goal (LTG)	Time frame to reach (STG)	Time frame to reach (LTG)	Date Goal initiated	Goal status
1. Bed mobility	Minimal assist (min A)	Mod I	Bedrails	Bedrails	14 days	30 days	Initial evaluation	Goal met
2. Transfers	Minimal assist (min A)	Supervision	Wheelchair and/or Parallel Bars	Front wheel walker and/or parallel bars	14 days	30 days	Initial evaluation	Goal met
3. Wheelchair propulsion	150 feet with supervision	150+ feet with Mod I	Manual Hemi-Wheelchair	Manual Hemi-Wheelchair	10 days	30 days	Initial evaluation	Goal met
4. Ambulation	Ambulation with max assist of 2-3	50 feet with Min A	Lite-Gait and treadmill	Front wheel walker	14 days	30 days	Initial evaluation	Goal met (STG)
5. Balance	Improve Function in sitting test to 53/56	N/A	None	N/A	14 days	30 days	Initial evaluation	Goal met
6. Balance	Initial Berg balance test	Improve Berg balance test by 10%	None	None	14 days	30 days	Initial evaluation	Goal met

STG= Short term goal LT=: Long term goal Mod I= Modified Independent

Interventions: Balance training, functional mobility, gait training, manual therapy, neuromuscular re-education, orthotic training, patient/caregiver training, therapeutic exercise, transfer/wheelchair training focused on decreasing impairments and activity limitations throughout the plan of care. **Functional mobility:** Bed mobility techniques, toilet transfers, wheelchair propulsion over even and uneven surfaces, transfers, donning upper/lower body clothing were all completed to improve independence of functional mobility. **Gait training:** Weight shifting activities in parallel bars, stepping strategies, standing perturbations at hips in anterior, posterior and lateral directions. Lite-Gait partial body weight support training using a treadmill to work on proper gait pattern, proper weight shifting. Ambulation in parallel bars with minimal assist and max verbal cues was achieved. **Therapeutic exercise:** L LE strengthening and ROM to facilitate hip adduction, abduction, flexion, extension, internal and external rotation, knee extension and flexion.. Nu-step bicycle riding with both LE's to help strengthen and facilitate use of the L LE. **Neuromuscular re-education:** Neurofacilitation techniques during sitting and standing to facilitate L UE and LE. Mirror training in sitting, standing, and ambulation to improve alignment and gait quality. Mirror therapy activities using R UE to help facilitate use of the L UE. Neuromuscular electrical stimulation (NMES) to L quads and hamstrings in side-lying with skateboard to facilitate L LE ROM. **Orthotic training:** Donning of Give-Mohr sling. Donning of multi-podus boot while in bed to keep L ankle in neutral, avoiding plantarflexion contracture.

A.



B.

C.

D.

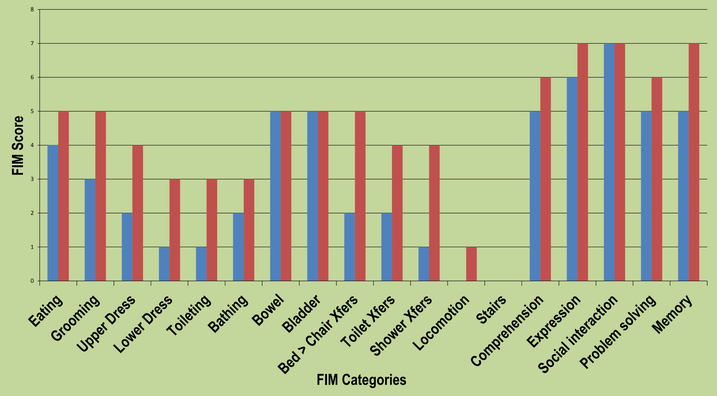
A: Lite Gait Training using LiteGait® partial body weight support system. B: Gait training using tactile and verbal cues in parallel bars. C: Nu-step bicycle to promote L UE and LE use. D: Visual feedback for postural alignment using mirror.

Outcomes:

Discharge Results	Right	Left
Sensory Integrity: Light touch	Normal sensation to RLE with light touch	Normal sensation to LLE with light touch
Sensory Integrity: Sharp/dull discrimination	Normal RLE.	Impaired lateral foot LLE.
Sensory Integrity: Proprioception	Normal RLE.	Impaired LLE, unable to correctly identify L great toe position 3 out of 5 trials.
Function in sitting test	Scored a 54/56	
Berg balance test	Scored an 11/56 one week prior to D/C. Scored an 18/56 at D/C.	
Reflex Integrity	Normal patellar and Achilles reflex RLE.	1+ patellar and Achilles reflex LLE.
Muscle tone/Modified Ashworth Scale	Normal muscle tone RLE.	Low tone in LUE and LLE, (-) clonus L ankle. Brunstrom stage 2, L UE flexor synergy, L LE development of extensor synergy
mCTSIB (modified clinical test on sensory interaction of balance)	Unable to be tested, due to focus on other intervention procedures and tests and measures.	
Functional Independent Measure (FIM)	At D/C, scored an 80/156 from PT, OT, SLP. **Physical Therapy measured categories:** Bed to Chair transfer: 5 – Supervision , Toilet Transfers: 4 – Min Assist, Shower, Transfers: 4 – Min Assist, Wheelchair propulsion: 6 – Mod I, Ambulation: 1 – Dependent, Stairs: 0 – Activity does not occur	

Minimally clinically important difference (MCID) on the FIM for brain injury is 22.

Functional Independence Measure (FIM) scores from Admission to Discharge



Legend: Blue = Admission Red = Discharge

FIM Scoring:

7 = Complete Independence
6 = Modified Independence (patient requires use of a device, but no physical assistance)
5 = Supervision or Setup
4 = Minimal Contact Assistance (patient can perform 75% or more of task)
3 = Moderate Assistance (patient can perform 50% to 74% of task)
2 = Maximal Assistance (patient can perform 25% to 49% of task)
1 = Total Assistance (patient can perform less than 25% of the task of requires more than one person to assist)
0 = Activity does not occur

Discussion: The patient received 18, 60-75 minute physical therapy sessions over a span of 21 days while in the inpatient rehabilitation unit. This case study utilized many essential rehabilitation interventions to improve functional mobility and self-care. The FIM is a standardized functional outcome measure that was used effectively in this case report to measure the improvement in functional mobility and self-care. Following the removal of the brain tumor, this patient benefitted from intense acute rehabilitation while in inpatient rehab unit to improve upon functional outcomes and become less dependent in performing ADL's. The rehabilitation team including physical therapy, occupational therapy, speech language pathology, and other health professionals took a multi-disciplinary approach to achieve these desirable outcomes. The patient stated he was satisfied with his overall improvement in functional independence and self care upon discharge to a skilled nursing facility.

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